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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/665,137
Filing Date: September 18, 2003
Appellant(s): GERLICH ET AL.

William C. Gehris
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed April 20, 2007 appealing from the Office action mailed 11/30/2006.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings, which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

WO 99/06893	Busato	02-1999
US 6,256,185	Maller	07-2001
US 4,915,204	Klotz et al.	04 - 1990
US 4,796,853	Butts et al.	01 - 1989
US 5,231,722	Shacklock et al.	08 - 1993
Horowitz et al.	The Art of Electronics	1989

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 - 3, 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Busato (WO 99/06893) in view of Horowitzh et al. textbook, The Art of Electronics and Shacklock et al. (US 5,231,722). Busato discloses most of the elements of Claim 1 including the electromagnetic valve being actuated by pulse-width modulation and

having a pulsed mode and a proportional mode having a higher frequency than the pulsed mode (Specification, page 7, lines 4 – 34), a solenoid (element 46 in Fig. 4) a power source for supplying the solenoid with electricity (+14.0 VDC in Fig. 4); a control unit (element 113 in Fig. 4) generating pulse-width-modulated signals (upper trace in Fig. 9); a switching device (element 26b in Fig. 4), the solenoid receives the pulse-width-modulated signals of the control unit via the switching device. However, it does not disclose a suppression device. Horowitzh et al. disclose a suppression device (diode in Fig. 2.4) connected in parallel to the inductor. It further makes a general statement in the Fig. 2.4 legend: "always use a suppression diode when switching an inductive load". It is general recommendation based on analysis of processes when the semiconductor switch drives the inductive load (pages 52 – 53) made irrespective of a pulse repetition rate, pulse width or any other pulse parameters. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the Busato solution by adding the protecting diodes according to Horowitz et al., because as Horowitz et al., state (page 64, left column), without this diode the inductor swing the collector to a large positive voltage when the switch is opened, most likely exceeding the collector-emitter breakdown voltage, thus endangering the transistor. Shacklock et al. disclose a solenoid driven by the switching device (72 in Fig. 6), the solenoid capable of receives the proportional pulse-width-modulated signals of the control unit via switching device (col. 15, lines 9 – 35); and a suppression device (74 in Fig. 6) for suppressing high-induced voltages at the solenoid. The solenoid is actuated by a pulse-width modulation at frequency 1 Khz (col. 12, lines

7 – 9, col. 15, lines 23 – 25), thus demonstrating that the upper frequency limit for use of the free wheeling diodes is far higher than the 200 Hz recited by Applicant. The motivation for use of the free wheeling diodes according to Shacklock is the same as above.

Regarding Claim 2, Horowitz et al discloses the suppression device as a free wheeling diode (diode in Fig. 2.4) connected in parallel to the solenoid. A motivation for modification of the primary reference is the same as above.

Regarding Claim 3, Busato discloses the valve being actuated in a proportional mode with a pulse frequency of 200 Hz (Specification, page 16, line 34 – page 17, line2)

Regarding Claim 7, Busato discloses the switching device as a power transistor (element 26a in Fig. 4).

Claims 5, 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Busato in view of Horowitzh et al., Shacklock et al. and Klotz et al. (US 4,915,204). As was stated above, Busato, Horowitzh et al. and Shacklock et al. disclose all the elements of Claim 1. However, regarding Claim 5, they do not disclose the power source including the vehicle's electrical system. Since the Klotz et al. invention is intended for use for motor vehicle (col. 1, lines 7 – 15), its solenoid valve actuation system (element 3280 in Fig. 27B) is inherently fed by the vehicle's electrical system. Both references have the same problem solving area, namely providing solenoid valve activation system. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the modified the Busato solution by

applying it in the motor vehicle engine system, because such application would substantially expand the market of the Maller control system manufacturer.

Regarding Claim 6, Klotz et al. disclose the solenoid valve actuation system (elements 3250 and 3280 in Fig. 27B, col. 108, lines 22 - 35), which is a part of transmission control system (element 3050 in Fig. 27A) controlled in turn by the engine controller (element 3020 in Fig. 27A, col. 45, line 42 – col. 47, line 46). A motivation for modification of the primary reference is the same as above.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Busato in view of Horowitzh et al., Shacklock et al. and Maller (US 6,256,185). Claim 8 differs from Claims 1, 6 and 7 rejected above by its limitation of the protecting diode connected in parallel to the power transistor. Maller discloses a diode (element Z3 in Fig. 4) connected in parallel to the power transistor. The reference is pertinent to the problem, which Applicant faces, i.e. providing protection to the switching transistor against over-voltage stress. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have further modified the Busato solution by adding the protection diode in parallel to the switching transistor according to teachings of Maller, because as Maller states (col. 7, lines 40 – 44), diode Z3 protects switching transistors Q2 and Q3 from static and unexpected high voltage input at solenoid connection point, for example, a static discharge generated by the installer of the controller or solenoid.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Busato in view of Horowitzh et al., Shacklock et al. and Butts et al. (US 4,796,853). As was stated above, Busato and Horowitzh et al. disclose all the elements of Claims 1 and 3. Claim 4 differs from Claim 3 by a value of the activation frequency equal to 50 Hz. Butts et al. disclose the solenoid driver using PWM actuation with the actuation frequency of 50 Hz (col. 20, lines 37 – 45). The reference is pertinent to the instant case since it faces the same problem, i.e. providing a proportional and pulse control of the solenoid valve. In the Busato system modified according to teachings of Shacklock et al. the solenoid have parallel-connected free wheeling diode. The selected frequency should be high enough to develop uninterrupted and smoothed solenoid current and practically permanent pressure on the loaded spring and at the same time should not be too high due to inertia of the exponential decay of the over-voltage pulses across the solenoid coil. The selected frequency is therefore is a result effective variable, which can be set by optimization. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the activation frequency to value of 50 Hz, according to Butts et al. because as Court Decision *In re Aller,* 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955) "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." And, *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976) the court states: In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists.

(10) Response to Arguments

A. Claims 1 – 3, 7 and 8 Argued Separately.

Applicant's arguments have been given careful consideration but they have been found non-convincing.

1. Appellant expresses his opinion that the "in solenoid controls such as Busato, where both high and low frequency signals are used for two modes of control, voltage suppression devices have generally been regarded as not desired as they have been thought of to interfere with the fine response required". It is true, as Horowitz et al. state: "The only disadvantage of this protection circuit is that it lengthens the decay of current through inductor". However, this statement being formulated in qualitative, not quantitative terms should not be taken as absolutely true without considering the conditions of the use; it should be qualified against parameters of the circuit, such as switching frequency. The longer decay of the current could adversely affect the circuit only at sufficiently high frequencies when the decay time becomes comparable to the pulse width. Otherwise, at relatively low frequencies the voltage suppression device (freewheeling diodes) could be used without causing any problem. Shacklock et al. used the free wheeling diode connected across the solenoid at frequency1 kHz, which is substantially higher than the highest Appellant's frequency (200 Hz) without adversely affecting the response times, i.e. the concerns about timing parameters are moot for frequencies at least 5 times higher than the Appellant's 200 Hz. Therefore, in view of Shacklock et al. reference one of ordinary skill in the art would be able to come to following conclusions:

(a) lengthening response times due to use of the suppression devices is not absolute barrier for their use at frequencies substantially higher than those used by Appellant;

(b) using Busato circuit at lower frequencies one would be able to successfully use the voltage suppression devices without having any adverse effects.

(c) successful use of the free wheeling diodes with frequencies 20 - 200 Hz (used by Appellant) without substantial drawbacks is possible and should not be considered as surprising result.

2. Appellant attacks Busato et al. and Horowitz et al. references for not disclosing all elements of the claim: Horowitz for not disclosing pulse width modulation, Busato for not using voltage suppression device (page 4, 5th and 6th paragraphs). In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). In current case, Busato discloses both single pulse and pulse width modulation, while Horowitz and Shacklock disclose the voltage suppression devices (see Claim 1 rejection).

3. Appellant further attacks the references motivation for combining together the Busato and Shacklock references on the basis that: "Shacklock is for a washing machine" (page 4, last paragraph). However, as stated in Office Action the motivation for adding the Shacklock reference is the same as for adding the Horowitz et al. reference, i.e. as Horowitz et al. state (page 64, left column), "without this diode the inductor swings the collector to a large positive voltage when the switch is opened, most

likely exceeding the collector-emitter breakdown voltage, thus endangering the transistor". The Shacklock reference without question is relevant for the case (analogous art), since it like another reference, Horowitz et al. and Appellant himself, discloses a use of the overvoltage suppression devices to suppress the voltage spikes across the inductive load.

4. Appellant alleges: "it has been surprisingly found that use of free wheeling diodes in proportional and pulsed mode control devices actually reduces noise for the control signals while permitting adequate response times" (page 4, 3rd paragraph). Even though Appellant's Specification is silent with regard to any feature of so-called pulse mode, as best understood by Examiner, both pulse and proportional modes involve pulses, supposedly having different pulse widths. As to reduction of noise, Maller (US 6,256,185) discloses the free wheeling diode (D3 in Fig. 4) as maintaining a continuous current through solenoid during pulse (col. 2, lines 61 – 65). The continuous current without ripples does not produce a noise. It is clear therefore, that usage of the free wheeling diode smoothes the shape of electrical pulses and reduces the noise. Therefore, reduction of noise due to usage of the free wheeling diodes is by no means unanticipated result, as Appellant alleges.

Additionally, reduction of noise is not mentioned in the Claims. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., reduction of noise) are not recited in the rejected claim(s). Although the claims are interpreted in

light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

3. Appellant further charges: "highly controlled Busato device has not been seen as needing suppression devices as the voltage is controlled via pulse modulation". However, to say so one should ignore collective experience of generations of designers, since such protection (freewheeling diodes) is used for at least 50 years, and recited in multiple textbook sources presented in the Office Action by the citation from Horowitz et al. stating: "Always use a suppression diode when switching an inductive load" (legend under Fig. 2.4). As to an impact of suppression devices on response times, it was addressed above.

Claim 4 Argued Separately.

4. Appellant attacks a following statement in the Claim 4 rejection: "The reference [Butts] is pertinent to the instant case since it faces the same problem, i.e. providing a proportional and pulse control of the solenoid valve". According to Appellant: "There appears to only one pulse width modulation control, not two modes".

The Butts reference was used only to demonstrate the solenoid drivers working at frequency 50 Hz. For that reason not all the details of the reference have been discussed. However, Butts discloses two modes, shifting and non-shifting shown in Fig. 3 and 4 (col. 1, lines 17 – 41). The shifting mode is actually the pulse mode, the short width pulses are applied individually, the solenoid current (Fig. 3) is discontinues and the valves armature moves in accordance with individual pulses. According to Butts

(col. 3, line 66 – col. 4, line 2): "In shifting modes of operation, the control unit 90 deactivates the common current circulation path of driver circuit 18, thereby enabling the valve spools 38-44 to move in synchronism with the modulation of the applied voltage for accurate pressure control. At the same time the nonshifting or steady state mode assumes maintaining the valve in the same position, i.e. a plurality of pulses are applied to maintain an average value of steady current (Fig. 4), which is proportional to the pulse width.

Therefore, Butts does disclose both the pulse mode and the proportional mode. Additionally, the Butts reference is relevant for the case since it discloses the solenoid driving with use of the voltage protection means (freewheeling diodes).

5. Applicant further alleges: "There is no motivation to combine Butts et al. with Busato, Horowitz et al. and Shacklock et al." However, as explicitly shown in the Office Action (Claim 4 rejection), the switching frequency (50 Hz) is a result effective variable and it is treated as such. A motivational statement is based on a legal precedent, the Court Decision *In re Aller* (see Office Action) stating: "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges". Therefore, it is an error to allege a lack of the motivational statement.

Claims 5 and 6 Argued Separately.

Applicant alleges an error in the following motivational statement: "Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was

made to have modified the Busato solution by applying it in the motor vehicle engine system, because such application would substantially expand the market of the Maller control system manufacturer". The Maller reference is used to show that the Busato system may be employed in the motor vehicle environment.

There is no alleged error in the motivational statement. Inventions and innovations do not occur in a vacuum but in a real world market conditions. In decision *KSR Int'l. Co. v. Teleflex, Inc.*, (Opinion 04-1350) the Supreme Court recognizes market demands as a decisive factor in technology development as follows:

1. "(a) When a work is available in one field, design incentives and other *market forces* can prompt variations of it, either in the same field or in another".
2. "In many fields it may be that there is little discussion of obvious techniques or combinations, and it often may be the case that *market demand,* rather than scientific literature, will drive design trends."

3. "Thus, if combining known elements is obvious to try, it may lead to a conclusion of obviousness, depending on the *needs and pressures of the market*".

Therefore, Examiner believes that the market considerations are legitimate element in a motivational statement.

Claim 8 Argued Separately.

There are no new Arguments with regard to Claim 8.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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7/20/07

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